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EXAMINER

PHILPOTT, JUSTIN M

ART UNIT PAPER NUMBER

2665

DATE MAILED: 09/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/553,966

Applicant(s)

WARD, KENNETH A.

Examiner

Justin M Philpott

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 6-38 is/are rejected.
- 7) ☒ Claim(s) 2-5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 April 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3,4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Drawings

1. Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 6 and 28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, claim 6 recites the limitation "said one service unit" in claim 4. There is insufficient antecedent basis for this limitation in the claim. Applicant may overcome this rejection by amending claim 6 to depend upon claim 5.

The terms "one service unit" and "quantum" in claim 28 are relative terms which render the claim indefinite. The term "quantum" as related to "one service unit" is not defined by claim 28 or claim 19, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Specifically, claim 19 appears to introduce the term "one service unit" to refer to a

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quantity of time for a particular service configuring step while claim 28 compares the term “one service unit” to the size of a channel request message. Furthermore, with respect to the term “one service unit” being related to a “quantum” smaller than a maximum message size, the term “quantum” does not have a clear definition as it does not clearly indicate whether it is a unit of, e.g., time or a unit of bit size, etc. Applicant may overcome this rejection by including a definition of the term “one service unit” within the claim such that it includes reference to a type of measure (e.g., period of time, quantity of bits, etc.).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 9-23 and 25-36 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,271,468 to Christensen et al.

Regarding claims 1, 12-14, 18 and 30-36, Christensen teaches a system for servicing a plurality of communication channels, comprising: a host adapter (e.g., channel controller 24 in FIG. 1) configured to service communication requests (e.g., I/O interrupt requests) from communication requestors (e.g., I/O devices via control units 26, 27) to communication targets (e.g., central processors 20, 21), wherein the host adapter (e.g., channel controller 24) provides for up to a maximum number of communication channels to service the communication requests;

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a communication fabric (e.g., system controller 22) configured to provide a limited bandwidth to the host adapter to service the communication requests, wherein the communication fabric (e.g., 22) couples the communication targets (e.g., 20, 21) to the host adapter (e.g., 24); a first memory (e.g., channel interrupt queues Q0-Q7 within main storage 23) configured to store a lowest level of a hierarchical channel map, wherein the lowest level comprises one bit for each communication channel supported by the host adapter (e.g., each entry in a queue corresponds to a channel interrupt), wherein each bit of the lowest level is set to indicate that the communication channel to which it is mapped has a pending communication request and is cleared if the communication channel to which it is mapped does not have a pending communication request (e.g., see col. 6, lines 3-17); a second memory (e.g., pending register 46) configured to store a top level of the hierarchical channel map, wherein each bit of the top level (e.g., bits PND(0) – PND (7)) maps to a section of the lowest level (e.g., each PND bit maps to a particular one of queues Q0-Q7), wherein each bit of the top level is set if at least one bit in the section of the lowest level to which it is mapped is set and is cleared if none of the bits in the section of the lowest level to which it is mapped are set (e.g., see col. 6, lines 24-50); wherein the host adapter is configured to determine a next channel to be serviced by examining the hierarchical channel map (e.g., channel controller 24 generates SIGI command which identifies the queue on which an entry will be posted for a received interrupt, wherein entries are serviced according to the order in which they are placed on the queue, see col. 5, line 65 – col. 6, line 17).

Regarding claims 9, 25 and 29, Christensen teaches the system as discussed above regarding claims 1, 12-14, 18 and 31-36 and further teaches a plurality of service class masks (e.g., I/O mask 51 comprising mask bits, see col. 6, lines 56-67), wherein each service class

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mask is configured to map a number of the communication channels to one of a plurality of service classes (e.g., mask bits configure communication channels to one of a plurality of queues wherein each queue has a designated priority, see col. 6, lines 51-59), wherein each service class (e.g., designated priority of the queue) is allocated a portion of the limited bandwidth on the communication fabric.

Regarding claims 10, 16 and 26, Christensen further teaches a service array (e.g., QID register 82) comprising a plurality of entries, wherein each entry indicates one of the service classes to be serviced during a current service unit (e.g., see col. 17, lines 22-30), wherein the service classes are selected in a repeating order according to the entries in the service array, and wherein the next channel to be serviced is selected from the current service class (e.g., see col. 9, line 24 – col. 10, line 31).

Regarding claims 11, 15, 17 and 27, Christensen further teaches for each service class a service mask for each level of the hierarchical channel map (e.g., via I/O mask 51 comprising mask bits, see col. 6, lines 56-67), wherein when its corresponding service class is being serviced each service mask indicates the next bit position to be examined within a selected group of bits to determine a selected group of bits to be examined at the next level (e.g., within the designated queue having the highest non-empty priority), except wherein the service mask for the lowest level indicates the next bit position to be examined within a selected group to determine the next channel with a pending request to be serviced (e.g., mask bits indicating the next enabled PND bit to be examined).

Regarding claim 19, Christensen further teaches the host adapter (e.g., CC 24) is configured to service for one service unit a channel request (e.g., I/O interrupt request) from a

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channel mapped to a set bit at the lowest level (e.g., an entry among one of the groups of Q0-Q7) of the hierarchical channel map, wherein the set bit is selected by examining a current group of bits at the lowest level of the hierarchical channel map to select a next set bit in that group indicating a channel with a pending request (e.g., a next entry within the designated queue among Q0-Q7), and if no more bits are set in the current group (e.g., the designated queue is empty), examining a current group at the next higher level (e.g., examine next bit of the PND register 46) to select a next set bit (e.g., next bit among PND(0)-PND(7)) and then examining the next lower level group (e.g., next queue among Q0-Q7 corresponding to the selected PND bit) indicated by the selected higher level set bit.

Regarding claim 20, as discussed above regarding claims 11, 15, 17 and 27, Christensen teaches a service mask for each level of the hierarchical channel map (e.g., via I/O mask 51 comprising mask bits, see col. 6, lines 56-67), wherein each service mask is configured to indicate the next bit position in the current group to be examined for a set bit (e.g., within the designated queue having the highest non-empty priority).

Regarding claim 21, Christensen further teaches each service mask (e.g., via I/O mask 51) is configured to indicate the bit position within the group for the corresponding level of the last selected set bit in that group (e.g., mask 51 indicates the bit position of PND, see col. 6, lines 51-68), wherein the host adapter (e.g., CC 24) is configured to examine each group for the next set bit after the bit position indicated by the corresponding service mask (e.g., see col. 6, lines 24-50).

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Regarding claim 22, Christensen further teaches each group of bits at one level of the hierarchical channel map has the same number of bits (e.g., each entry in top level, PND register 46, comprises one bit).

Regarding claim 23, Christensen further teaches each group of bits at the lowest level (e.g., groups Q0-Q7) is accessible by a single memory access (e.g., see col. 9, line 24 – col. 10, line 21).

Regarding claim 28, Christensen teaches a service unit is a quantum smaller than a maximum message size for the channel requests (e.g., I/O interrupt request) (e.g., see col. 5, line 63 – col. 6, line 50, wherein a message size of the interrupt request, SIGI, exceeds the size of a interrupt request entry in the queues Q0-Q7).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 7, 8, 24, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christensen.

Regarding claims 7 and 37, Christensen teaches the system of claims 1 and 31-36 as discussed above and, further, teaches the first memory (e.g., Q0-Q7) and the second memory (e.g., PND(0)-PND(7)) are accessible by the host adapter (e.g., CC 24 accesses memory comprised within SC 22 and MS 23). While Christensen may not specifically require both first

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and second memory to be located on a same memory block, it is generally considered to be within the ordinary skill in the art to shift the location of parts absent a showing of unexpected results. Thus, at the time of the invention it would have been obvious to one of ordinary skill in the art to shift the location of the second memory (e.g., PND) from its current memory position to a memory block comprising the first memory (e.g., Q) since it is generally considered to be within the ordinary skill in the art to shift the location of parts absent a showing of unexpected results. The contention of obvious choice in design can be overcome if Applicant establishes unexpected results. In re Japikse, 86 USPQ 70 (CCPA 1950).

Regarding claims 8, 24 and 38, Christensen teaches the system of claims 1, 18 and 31-36 as discussed above and, further, teaches the second memory (e.g., PND register 46) is a register comprised within an integrated circuit (e.g., within 22). While Christensen may not specifically require that the integrated circuit comprising the second memory is specifically located within the host adapter (e.g., 24), it is generally considered to be within the ordinary skill in the art to shift the location of parts absent a showing of unexpected results. Thus, at the time of the invention it would have been obvious to one of ordinary skill in the art to shift the location of an integrated circuit comprising the second memory from its current position to a position within the host adapter (e.g., 24), since it is generally considered to be within the ordinary skill in the art to shift the location of parts absent a showing of unexpected results. The contention of obvious choice in design can be overcome if Applicant establishes unexpected results. In re Japikse, 86 USPQ 70 (CCPA 1950).

Allowable Subject Matter

8. Claims 2-5 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claim 6 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: claim 2 recites the limitation of, in addition to a lowest level and a top level within the system as recited in claim 1, one or more intermediate levels, wherein each intermediate level comprises a plurality of bits, each one mapping to a group of bits in the next lower intermediate level, wherein each bit indicates if at least one bit in the group to which it maps is set, wherein a highest intermediate level comprises groups of bits mapped to individual one of the bits of the top level, and wherein a lowest intermediate level comprises bits each mapping to one of the groups of the lowest level of the hierarchical channel map; claims 3-6 comprise further limitations of claim 2.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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U.S. Patent No. 6,378,036 to Lerman et al. discloses a hierarchical queuing architecture, and U.S. Patent No. 6,463,484 to Moss discloses a method of egress port scheduling using memory efficient request storage.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Justin M Philpott whose telephone number is 703.305.7357. The examiner can normally be reached on M-F, 9:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy D Vu can be reached on 703.308.6602. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.305.4750.


Justin M Philpott


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